

REMARKS/ARGUMENTS

The applicants thank the Examiner for his Office Action dated June 9, 2004. Claims 7 and 9 have been cancelled and Claims 10-15 have been withdrawn (without prejudice) from consideration at this time. Claims 19-22 have been added and Claims 2-5, 16, and 18 have been amended and are discussed further herein. Thus, **Claims 1-6, 8, and 16-22** are currently pending in the application. Additionally, the drawings have been formalized and copies are attached to this paper. No new matter has been introduced. Reconsideration and allowance are hereby requested.

Rejections Under 35 U.S.C. § 112

Claims 2-5, 7, 8, 9, and 16-18 have been rejected under 35 U. S. C. §112, 2nd paragraph, as being indefinite. **Claims 7 and 9** have been cancelled thereby making moot this ground for rejection. **Claims 2-5, 8, and 16-18** have been amended in a manner believed to satisfy the requirements of §112. Accordingly, applicants request that this ground for rejection be withdrawn as to the affected claims.

ART RELATED REJECTIONS

1. Rejections based on ZHONG:

Rejections Under 35 U.S.C. § 102

Claims 1-6, 8, and 16-18 have been rejected under 35 U. S. C. §102(e) as being unpatentable over *Zhong, et al* (US Pat. Appl. Publ. No. 2003/0179549A1)(hereinafter *Zhong*).

Claims 1-6 and 8:

As to **Claim 1** the applicants point out that the claimed apparatus includes a heatspreader “in thermal communication with the set of thermal solder balls **positioned near the perimeter of the package**”. There is no teaching or suggestion that the heat spreader of *Zhong* is connected with thermal solder balls at the perimeter of the package. The thermal and ground vias 316 of *Zhong* are in the center of the substrate. Moreover, *Zhong* does not teach or suggest that such vias should be connected to thermal solder balls at the periphery of the substrate as claimed in the present invention.

On the surface this seems to be a superficial distinction. However, in operation, the positioning of the thermal balls at the outer edge of the package has significant performance advantages. For one it more effectively exposes the balls to the ambient cooling temperature at the edge of the package. Whereas, if the balls are in the center, the heat is trapped under the package and does not help cooling. This fact is particularly relevant because the *Zhong* patent does discuss improved cooling performance in great detail. In fact, it mentions the close proximity of the heatspreader to the die and the increased size of the heatspreader as causes of increased thermal performance. Significantly, ***Zhong does not mention the presence of perimeter mounted thermal solder balls as a cause of improved thermal performance nor does Zhong mention thermal cooling paths from the heatspreader into the edge mounted thermal balls.*** *Zhong* simply misses the point and expresses no appreciation of the unique advantages wrought by the claimed invention. Thus, not only does *Zhong* not teach this claim limitation, *Zhong* also does not suggest this claim limitation.

Additionally, *Zhong* fails to teach “a substrate including at least one electrical ground plane”. The Action characterizes 720 of *Zhong* a ground plane. A close reading of *Zhong* reveals that 720 is “an exposed contact pad 720” or alternatively as “a metal pad, ring, trace, or other land type contact”. In *Zhong*, 720 is merely as a contact point for an electrical connection. As is known to those having ordinary skill in the art a ground plane is a large planar metallic construction which covers a large portion of a substrate or die surface. It is not a small contact pad or thin ring structure. Consequently, *Zhong* fails to teach a ground plane and is therefore missing an element of the claimed invention.

Accordingly, *Zhong* has failed to teach all the claim limitations, as required to sustain an anticipation rejection under §102. Therefore, *Zhong* has failed to establish an effective rejection as to Claim 1. Accordingly, applicants respectfully suggest that this grounds for rejection be withdrawn.

Moreover, for at least these reasons, the cited art has failed to teach all the claim limitations of rejected dependent claims 2-6 and 8. Therefore, *Zhong* has failed to establish an anticipation rejection under §102 as to these claims. Other distinctions between these dependent claims and the cited art can be made, but are not deemed necessary at this time due to the sufficiency of the arguments made hereinabove. Accordingly, applicants respectfully suggest that this grounds for rejection be withdrawn as to Claims 1-6.

Claims 16-18:

As to Claim 16, the same arguments raised above apply. For example, the cited references do not teach or suggest “a substrate including at least one electrical **ground plane**” or

“a set of **thermal solder balls electrically connected with a ground plane and positioned near the perimeter of the package**”. Additionally, the cited art does not teach a “heat spreader mounted on the package with **conductive mounting pegs**”. The only features described in *Zhong* are filled vias. The vias are not part of the heatspreader, but are rather part of the substrate. There are no mounting pegs depicted or otherwise described anywhere in *Zhong*. Accordingly, *Zhong* cannot be said to teach or suggest a heatspreader having conductive pegs

Accordingly, *Zhong* has failed to teach all the claim limitations of Claim 16.

Accordingly, *Zhong* is insufficient to sustain an anticipation rejection under §102 as to Claim 16. Accordingly, applicants respectfully request withdrawal of this ground for rejection. Moreover, for at least these reasons, the cited art has failed to teach all the claim limitations of rejected dependent claims 17 and 18. Therefore, *Zhong* has failed to sustain an anticipation rejection under §102 as to these claims. Other distinctions between these dependent claims and the cited art can be made, but are not deemed necessary at this time due to the sufficiency of the arguments made hereinabove. Accordingly, applicants respectfully suggest that this grounds for rejection be withdrawn as to Claims 16-18.

Therefore for the reasons expressed above, the applicants respectfully request the withdrawal of the rejections of Claims 1-6, 8, and 16-18.

2. Rejections based on *HUANG*:

Rejections Under 35 U.S.C. § 102

Claims 1-3, 6, and 8 have been rejected under 35 U. S. C. §102(e) as being unpatentable over *Huang, et al* (USPN 6,703,698)(hereinafter *Huang*).

As to **Claim 1**, *Huang* fails to teach “a substrate including at least one electrical ground plane”. The ground plane 201b of *Huang* is part of the die (e.g., 210). Thus, *Huang* makes use of a completely different substrate structure. This is a non-trivial exercise because by using a substrate mounted ground plane the claimed invention attains far superior electromagnetic interference (EMI) performance over any such constructed as suggest with respect to *Huang*. Consequently, *Huang* fails to teach a ground plane as part of the substrate as required to sustain an anticipation rejection under §102.

Accordingly, *Huang* has failed to teach all the claim limitations of Claim 1. Accordingly, *Huang* is not sufficient to sustain an anticipation rejection of Claim 1. Therefore, applicants respectfully suggest that this ground for rejection be withdrawn.

Moreover, for at least these reasons, the cited art has failed to teach all the claim limitations of rejected **dependent Claims 2-3, 6, and 8**. Other distinctions between these dependent claims and the cited art can be made, but are not deemed necessary at this time due to the sufficiency of the arguments made hereinabove. Accordingly, applicants respectfully request the withdrawal of this ground of rejection as to Claims 1-3, 6, and 8.

Rejections Under 35 U.S.C. § 103

Claims 4, 5, and 16-18 have been rejected under 35 U. S. C. §102(a) as being unpatentable over *Huang, et al* (USPN 6,703,698)(hereinafter *Huang*).

As to **Claim 4 (and claims 1-3)**, *Huang* is cited as teaching conductive mounting pegs 201c. The *Huang* specification clearly points out (for example at col. 5: lns. 43-46) that the “pegs” are actual “I/O vias”. Thus, *Huang* does not teach a heat spreader having pegs. *Huang* teaches a standard technology, a substrate with vias. The pegs of the present heat spreader are intended to be positioned in mounting holes that pass entirely through a substrate. No such pegs are present in *Huang*. Additionally, *Huang* specifically fails to teach “a substrate including at least one electrical ground plane”. The ground plane 201b of *Huang* is part of the die (e.g., 210). Thus, *Huang* makes use of a completely different substrate structure. Using a substrate mounted ground plane is not an obvious engineering choice due to the substantially improved EMI properties of the resultant shielding structure. Consequently, *Huang* fails to teach or suggest the claim limitations of : 1) a ground plane as part of the substrate and 2) mounting pegs on the substrate (such pegs are typically fitted into substrate openings to align and properly position the heatspreader) as required to establish a *prima facie* case of obviousness as required under §103.

Accordingly, *Huang* has failed to teach all the claim limitations of Claim 4. Accordingly, *Huang* has failed to establish a *prima facie* case of obviousness as to Claim 4. Therefore, applicants respectfully suggest that this ground for rejection be withdrawn.

Moreover, since the same limitations are present in **Claims 5 and 16-18**, for at least the above reasons, cited art has failed to teach all the claim limitations of these claims. Other distinctions between these claims and the cited art can be made, but are not deemed necessary at this time due to the sufficiency of the arguments made hereinabove. Accordingly, applicants respectfully suggest that this grounds for rejection be withdrawn as to Claims 4, 5, and 16-18.

Added Claims 19-22:

Claims 19-22 are added to more clearly capture certain patentable subject matter. No new matter has been added. Using Claim 19 as an example, the mounting pegs are more clearly

identified as being “conductive mounting pegs that pass through the substrate”. Support for this language is found throughout the specification. For example, see Fig. 2 “212” or Fig. 3 “312” and the associated supporting language in the specification. Also, the pegs are clearly identified as contacting “leads formed on the back surface of the substrate” wherein the leads extend “outward from the middle of the substrate to the set of thermal solder balls positioned near the perimeter of the package” thereby enabling a portion of the heat generated by the die to be dissipated from the die through the heat spreader into the set of thermal solder balls. Again reference is made, for example, to Fig. 4(b) “405” and the supporting specification. The additional arguments made above with respect to Claim 16 are similarly applicable here. Moreover, there is no teaching in the cited art of “conductive mounting pegs that pass through the substrate” or “leads formed on the back surface of the substrate” such that the leads extend “outward from the middle of the substrate to the set of thermal solder balls positioned near the perimeter of the package”. Absent teachings of these limitations, it is respectfully submitted that the added claims are allowable over the cited art.

Amendments to the Drawings:

Formal drawings have been supplied herewith. Such drawings contain the requested hash marks and should meet with the requirements of the Examiner. All changes to the drawings are in agreement with the original figures. Therefore, no new matter has been added.

Conclusion:

In view of the foregoing amendments and remarks, it is respectfully submitted that the claimed invention as presently presented is patentable over the art of record and that this case is now in condition for allowance.

Should the Examiner, for any reason, wish to contact the undersigned, he is cordially invited to do so at his convenience. Moreover, if the Examiner has any continuing concerns regarding this case, he is invited to contact the undersigned at (650) 961-8300.

Respectfully submitted,

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